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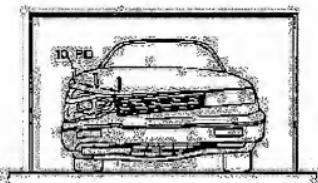
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## (54) SYSTEM FOR ESTIMATING ACCIDENT AUTOMOBILE REPAIR COST BY THREE-DIMENSIONAL STEREOSCOPIC MEASUREMENT AND METHOD AND METHOD FOR SETTING ESTIMATE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a system and method for estimating accident automobile repair costs by three-dimensional stereoscopic measurement in which the quantitative measurement of the shape of an accident automobile can be operated by using a three-dimensional stereoscopic measuring method, the estimation of the repair costs of the accident automobile can be simply operated, and accuracy can be obtained.

**SOLUTION:** The shape data of an accident automobile are obtained by using a pointing device(PD) capable of three-dimensional positioning, and the irradiation of a laser beam, ultrasonic wave, or counter line pattern. The obtained shape data of the accident automobile and the shape data of a non-accident automobile are compared and synthesized so that the three-dimensional shape of the shape of the accident automobile can be restored. The damaged site of the accident automobile are quantitatively captured and specified from the restored three-dimensional shape of the accident automobile. Thus, body distortion or the like can be quantitatively captured in an estimation stage, and following estimate preparation can be quickly and exactly attained.



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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] About the system which estimates repair cost of an accident vehicle, especially, this invention measures the configuration of an accident vehicle etc. using the three-dimension solid measurement technique, and relates to the accident vehicle repair cost estimated system by the three-dimension solid measurement which estimates repair cost of an accident vehicle based on the this measured data, an estimate setting-out means, and an approach.

[0002]

[Description of the Prior Art] The estimated operator observed the accident vehicle with the naked eye thru/or the photography image, and the estimated approach of the conventional accident vehicle judged the damage, investigated a breakage part and breakage components, determined the repair cost of a characteristic (value by which the unit price set up suitably is multiplied), and others to raising and this breakage component, and the whole repair cost was in it also as the bid.

[0003] However, the variation in the bid according [\*\*\*\*] the ambiguity according to an estimated operator's subjectivity with the approach of observing the above accident vehicles with a naked eye thru/or a photography image, and making a damage judgment, to an experience and intuition of \*\*\*\* and an estimated operator was large.

[0004]

[Problem(s) to be Solved by the Invention] Then, it is in offering the accident vehicle repair cost estimated system by the three dimension solid measurement which can estimate repair cost with little variation by the estimated operator based on this data, an estimate setting out means, and an approach, since the object of this invention can obtain the objective quantitative data about an accident vehicle by being make in order to solve the above-mentioned problem, and performing measurement of the configuration of an accident vehicle etc. using the three dimension solid measurement approach.

[0005]

[Means for Solving the Problem] The configuration measurement data input unit into which invention according to claim 1 inputs the configuration measurement data of an accident vehicle, The coordinate measuring device which measures the coordinate location data on the three dimension in which this configuration measurement data input device exists by irradiating light, A car shape memory means to hold the information about the configuration of a car, and the configuration measurement data transmitted from this configuration measurement data input device, An estimate setting-out means to set up the bid of the repair cost of an accident vehicle based on the coordinate location data transmitted from this coordinate measuring device, and the information on the configuration of the car transmitted from this car shape memory means, In the accident vehicle repair cost estimated system by the three-dimension solid measurement which has an estimate creation means to draw up an estimate based on the estimated data transmitted from this estimate setting-out means The detection section as which said configuration measurement data input unit detects a contact condition with said accident vehicle, An origin assignment means to specify the origin of configuration measurement of said accident vehicle, and a terminal point assignment means to specify the terminal point of configuration measurement of said accident vehicle, To said estimate setting-out means from the light sensing portion which receives the light irradiated from said coordinate measuring device, and this configuration measurement data input unit It has a means to transmit the configuration measurement data obtained by said detection section, said origin assignment means, said terminal point assignment means, or said light sensing

portion. Said coordinate measuring device An exposure means to irradiate light from three directions to said configuration measurement data input unit, It has a means to transmit the coordinate location data of said configuration measurement data input device to said estimate setting-out means. Said car shape memory means It has data about the configuration of a non-accident vehicle. Said estimate setting-out means Said configuration measurement data transmitted from said configuration measurement data input device, A count means to ask for the coordinate location of said light sensing portion based on said coordinate location data transmitted from said coordinate measuring device, An amendment means to ask for the coordinate location of said detection section from the coordinate location of said light sensing portion for which it asked with said count means, The data about the configurations of the coordinate location of said detection section obtained with said amendment means and said non-accident vehicle transmitted from said car shape memory means are compounded. A decision means to judge whether there is any breakage part exceeding a sheet-metal correction limitation from the three-dimension configuration of said accident vehicle restored by restoration means to restore the three-dimension configuration of said accident vehicle, and said restoration means, When it is judged that there is no breakage part where said decision means exceeds a sheet-metal correction limitation, it has a selection means to choose the estimate of the sheet-metal correction according to a breakage part, and a means to transmit the estimate which said selection means chose to an estimate creation means.

[0006] Said coordinate measuring device can be further equipped with the position sensor which carries out sensing of the coordinate location data with which it had further a dispatch means by which said configuration measurement data input device sent the coordinate location data of said configuration measurement data input device in claim 1 in invention according to claim 2, and said dispatch means sent it from three directions, and measures said coordinate location data.

[0007] The configuration measuring device with which invention according to claim 3 measures the configuration of an accident vehicle, and a car shape memory means to hold the information about the configuration of a car, An estimate setting-out means to choose the bid of the repair cost of an accident vehicle based on the configuration measurement data transmitted from this configuration measuring device, and the information on the configuration of the car transmitted from this car shape memory means, In the accident vehicle repair cost estimated system by estimate creation means to draw up an estimate based on the estimated data transmitted from this estimate setting-out means, and the three-dimension solid measurement which it has Two or more floodlighting equipments which floodlight said configuration measuring device on said accident vehicle from the left right-hand side of said accident vehicle, an order side, and an upside, Two or more light-receiving equipments which receive the light which it was floodlighted from said floodlighting equipment and reflected with the left right-hand side of said accident vehicle, the order side, and the up side, It has a transfer means to transmit the data about floodlighting of said floodlighting equipment, and the data about light-receiving of said light-receiving equipment to said estimate setting-out means. Said car shape memory means It has data about the configuration of a non-accident vehicle. Said estimate setting-out means A distance count means to find the distance of said accident vehicle and two or more of said floodlighting equipments of each based on the data about floodlighting of said floodlighting equipment which said transfer means transmitted, and the data about light-receiving of said light-receiving equipment, Said distance acquired with said distance count means and the data about the configuration of said non-accident vehicle transmitted from said car shape memory means are compounded. A decision means to judge whether there is any breakage part exceeding a sheet-metal correction limitation from the three-dimension configuration of said accident vehicle restored by restoration means to restore the three-dimension configuration of said accident vehicle, and said restoration means, When it is judged that there is no breakage part where said decision means exceeds a sheet-metal correction limitation, it has a selection means to choose the estimate of the sheet-metal correction according to a breakage part, and a means to transmit the estimate which said selection means chose to an estimate creation means.

[0008] Invention according to claim 4 is set to claim 3. Said configuration measuring device Two or more wave transmission equipments which transmit a supersonic wave on said accident vehicle from the left right-hand side of said accident vehicle, an order side, and an upside, Two or more wave-receiving equipments which receive the supersonic wave which waves were transmitted from said wave transmission equipment, and was reflected with the left right-hand side of said accident vehicle, the order side, and the up side, It has a transfer means to transmit the data about wave transmission of said wave transmission equipment, and the data about wave-receiving of said wave-receiving equipment to said estimate setting-out means. Said distance count means

Based on the data about wave transmission of said wave transmission equipment which said transfer means transmitted, and the data about wave-receiving of said wave-receiving equipment, the distance of said accident vehicle and two or more of said wave transmission equipments of each can be found.

[0009] Invention according to claim 5 is set to claim 3. Said configuration measuring device The pattern light irradiation device which performs the pattern exposure of a contour-line pattern from whenever [ slanting up bearing / of an accident vehicle ] to this accident vehicle, The photography equipment which photos the configuration data of said accident vehicle including said contour-line pattern irradiated by said accident vehicle from whenever [ slanting up bearing / of said accident vehicle ], It has a transfer means to transmit the configuration data of said accident vehicle which included said contour-line pattern which the data about an exposure and said photography equipment of said pattern light irradiation device photoed in said estimate setting-out means. Said car shape memory means is equipped with the configuration data of this non-accident vehicle including said contour-line pattern irradiated by the non-accident vehicle. Said estimate setting-out means It has further a comparison means to compare the configuration data of said accident vehicle including said contour-line pattern of the accident vehicle transmitted from said configuration measuring device with said configuration data including said contour-line pattern of the non-accident vehicle transmitted from said car shape memory means. Said restoration means The configuration of said accident vehicle can be restored based on the comparison of said comparison means.

[0010] In the estimate setting-out means in the accident vehicle repair cost estimated system according [ invention according to claim 6 ] to three-dimension solid measurement This configuration measurement data transmitted from the configuration measurement data input device which inputs the configuration measurement data of an accident vehicle, A count means to ask for the coordinate location of the light sensing portion which receives the light irradiated from this coordinate measuring device based on these coordinate location data transmitted from the coordinate measuring device which measures the coordinate location data on the three dimension in which this configuration measurement data input device exists, An amendment means to ask for the coordinate location of the detection section which detects a contact condition with said accident vehicle from the coordinate location of said light sensing portion for which it asked with said count means, The data about the configuration of the non-accident vehicle transmitted from a car shape memory means to hold the information about the coordinate location of said detection section and the configuration of a car which were acquired with said amendment means are compounded. A decision means to judge whether there is any breakage part exceeding a sheet-metal correction limitation from the three-dimension configuration of said accident vehicle restored by restoration means to restore the three-dimension configuration of said accident vehicle, and said restoration means, When it is judged that there is no breakage part where said decision means exceeds a sheet-metal correction limitation, it has a selection means to choose the estimate of the sheet-metal correction according to a breakage part, and a means to transmit the estimate which said selection means chose to an estimate creation means.

[0011] In the estimate setting-out means in the accident vehicle repair cost estimated system according [ invention according to claim 7 ] to three-dimension solid measurement said estimate setting-out means The data about floodlighting of two or more floodlighting equipments floodlighted on this accident vehicle from the left right-hand side of an accident vehicle, an order side, and an upside, A distance count means to find the distance between this accident vehicle and these two or more floodlighting equipments of each based on the data about light-receiving of two or more light-receiving equipments which receive the light from the left right-hand side which this floodlighting equipment floodlighted and was reflected from said accident vehicle, an order side, and an upside, The data about the configuration of the non-accident vehicle transmitted from a car shape memory means to hold the information about said distance acquired with said distance count means and the configuration of a car are compounded. A decision means to judge whether there is any breakage part exceeding a sheet-metal correction limitation from the three-dimension configuration of said accident vehicle restored by restoration means to restore the three-dimension configuration of said accident vehicle, and said restoration means, When it is judged that there is no breakage part where said decision means exceeds a sheet-metal correction limitation, it has a selection means to choose the estimate of the sheet-metal correction according to a breakage part, and a means to transmit the estimate which said selection means chose to an estimate creation means.

[0012] Invention according to claim 8 is set to claim 7. Said distance count means The data about wave transmission of two or more wave transmission equipments which transmit a supersonic wave on said accident

vehicle from the left right-hand side of said accident vehicle, an order side, and an upside, Based on the data about wave-receiving of two or more wave-receiving equipments which receive a supersonic wave, the distance between said accident vehicle and said two or more wave transmission equipments of each can be found from the left right-hand side which said wave transmission equipment transmitted and was reflected from said accident vehicle, an order side, and an upside.

[0013] Invention according to claim 9 is set to claim 7. Said estimate setting-out means The configuration data of this accident vehicle including the contour-line pattern of the accident vehicle transmitted from the configuration measuring device which measures the configuration of an accident vehicle, It can have further a comparison means to compare the configuration data transmitted from a car shape memory means to hold the configuration data of this non-accident vehicle including this contour-line pattern irradiated by the non-accident vehicle, and said restoration means can restore the configuration of said accident vehicle based on the comparison of said comparison means.

[0014] The configuration measurement data input step into which invention according to claim 10 inputs the configuration measurement data of an accident vehicle with a configuration measurement data input device, The coordinate measurement step which measures the coordinate location data on the three dimension in which said configuration measurement data input device exists with a coordinate measuring device, The configuration measurement data obtained by said configuration measurement data input step, The estimate setting-out step which sets up the bid of the repair cost of an accident vehicle based on the coordinate location data obtained by said coordinate measurement step, and the information on the configuration of the car obtained from a car shape memory means by which the configuration of a non-accident vehicle was memorized, In the accident vehicle repair cost estimated approach by the three-dimension solid measurement which has the estimate creation step which draws up an estimate based on the estimated data obtained by said estimate setting-out step The light-receiving step which receives the light by which said configuration measurement data input step was irradiated from said coordinate measuring device by the light sensing portion, The detection step which detects a contact condition with said accident vehicle in the detection section, and the origin assignment step which specifies the origin of configuration measurement of said accident vehicle, To said estimate setting-out step from the terminal point assignment step which specifies the terminal point of configuration measurement of said accident vehicle, and this configuration measurement data input step It has the step which transmits the configuration measurement data obtained by said light-receiving step, said detection step, said origin assignment step, or said terminal point assignment step. The exposure step to which said coordinate measurement step irradiates light from three directions to said configuration measurement data input unit, It has the step which transmits the coordinate location data of said configuration measurement data input device to said estimate setting-out step. Said estimate setting-out step Said configuration measurement data obtained by said configuration measurement data input step, The count step which asks for the coordinate location of said light sensing portion based on said coordinate location data obtained by said coordinate measurement step, The amendment step which asks for the coordinate location of said detection section from the coordinate location of said light sensing portion for which it asked by said count step, The data about the configurations of the coordinate location of said detection section obtained by said amendment step and said non-accident vehicle obtained from said car shape memory means are compounded. The decision step which judges whether there is any breakage part exceeding a sheet-metal correction limitation from the three-dimension configuration of said accident vehicle restored by the restoration step which restores the three-dimension configuration of said accident vehicle, and said restoration step, When it is judged that there is no breakage part where said decision step exceeds a sheet-metal correction limitation, it has the selection step which chooses the estimate of the sheet-metal correction according to a breakage part, and the step which transmits the estimate which said selection step chose to an estimate creation step.

[0015]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail with reference to a drawing.

[0016] Gestalt 1 drawing 1 of operation is a schematic diagram explaining the repair estimated system and approach of an accident vehicle based on three-dimension solid measurement using the pointing device for measurement which is the gestalt of 1 operation of this invention.

[0017] In drawing 1 , the front face of an accident car is traced by PD point, performing three-dimension positioning of PD point using the pointing device (PD) 10 in which three-dimension positioning is possible.

[0018] Drawing 2 shows only the motion which PD20 traces. Thus, while continuation--ization-processing the

obtained surface location data and reproducing and displaying the approximate value of a line and a field configuration, the configuration of an accident vehicle is grasped, restored and specified quantitatively. In addition, (the sampling of \*\*\*\* being included) and the quantitative grasp of a car configuration made to correspond for every type of a car become very easy by making it link with the configuration item data (an image image, dimension, etc.) of the automobile which carried out are recording storage beforehand. Moreover, it becomes possible to grasp quantitatively car-body distortion which has been grasped only after fixing to the fixture for repair and removing a skin panel etc. conventionally in an estimated phase.

[0019] Drawing 3 shows how to trace the range required for paint repair by PD30.

[0020] In drawing 3 , the required range of paint repair may be easily grasped by tracing an outside profile using PD30 and making the range, location magnitude, etc. specify. It is possible to grasp the paint repair range quantitatively including the location and magnitude, and to carry out automatic calculation of the paint characteristic (for it to change with magnitude by the part) by this.

[0021] Drawing 4 shows the case where the paint range (44) straddles two breakage parts (40 42). Paint differs from a characteristic by whether magnitude, a location, and other breakage parts are straddled. Automatic calculation is carried out and very troublesome characteristic count (characteristics, such as existence of the shading-off processing in paint, change with the location of the part which straddles, and the range, magnitude, etc.) in case the paint range straddles two or more parts may also be promptly reflected in an estimate.

[0022] The measuring method of the configuration data of the accident vehicle of this invention which used PD for below is shown.

[0023] A head light sensing portion is prepared in the head of a measuring method (1) 1 PD, and the detection section which detects a contact condition to the point of PD is prepared.

[0024] (2) Hit light, such as infrared radiation, to PD head light sensing portion from the slanting upper part location (three directions) of PD.

(3) Deduce the coordinate location of a head light sensing portion by the phase contrast analysis of a vector, distance detection, etc.

[0026] (4) Perform location amendment to a point from a head light sensing portion (a location is amended in consideration of an element besides the inclination of PD, and the distance to a point).

[0027] (5) In addition, in order to set up the origin and terminal point of a measuring point, form an origin assignment means and a terminal point assignment means in PD.

[0028] (6) In addition, form a paint range assignment mode change means in PD preferably.

[0029] The possible dispatch element thru/or receiving element of location sensing is included in the head or point of a measuring method (1) 2 PD.

[0030] (2) Sensing from the 2-way from which three directions thru/or height differ performs three-dimension positioning directly.

[0031] (3) When it prepares in a head, perform location amendment of a point.

[0032] (4) In addition, in order to set up the origin and terminal point of a measuring point, form an origin assignment means and a terminal point assignment means in PD.

[0033] (5) In addition, form a paint range assignment mode change means in PD preferably.

[0034] Measuring method 3, others, and the position sensor that can measure and follow the three-dimension location of PD are used. Common use with pen typing equipment is also possible for PD. A means to make the profile configuration which consists of surface profile data obtained by Above PD reflect in the photography image data or automobile graphic data obtained with the digital camera etc. is established.

[0035] Gestalt 2 drawing 5 and drawing 6 of operation show the approach 2 (thing using slit laser light) of the three-dimension solid measurement which is the gestalt of 1 operation of this invention.

[0036] In drawing 5 and drawing 6 , the optical three-dimension configuration measuring device formed in the both sides (50 52) of a car body, upper part (54), the front (60), and back (not shown [ back ]) combines floodlighting equipment and light-receiving equipment, and expresses it as a box.

[0037] Drawing 7 shows the outline of an optical three-dimension configuration measuring device.

[0038] In drawing 7 , the laser beam which carried out outgoing radiation from the floodlighting component 74 in floodlighting equipment 72 lets a slit 76 pass, and is irradiated by the point P of the measuring object 70 which only distance S separated from the slit 76. It reflects, is condensed with the light-receiving lens O which only distance L separated from Point P, and image formation of the irradiated laser beam is carried out to the location sensing element 78.

[0039] Drawing 8 shows the more detailed configuration of an optical three-dimension configuration measuring device.

[0040] In drawing 8 , the laser beam which carried out outgoing radiation from the floodlighting component 80 which consists of semiconductor laser and LED passes along a rat tail and a slit (it is level) by the floodlighting lens 82, and irradiates the object 84 for measurement as one (perpendicularly scanned by the polygon mirror) slit light. It is condensed with the light-receiving lens 86, and image formation of the laser beam reflected on the front face for [ 84 ] measurement is carried out on the location sensing element 90. The distance R in one point of a slit reflector to find is [0041].

$$[Equation 1] R=(1+Ia/Ib)BF/L[m]$$

It asks by the formula. Here, the current and B to which Ia and Ib flow to the location sensing element 90 are [ the distance between the light-receiving lens 86 and the location sensing element (PSD) 90 and L of the distance between the light-receiving lens 86 and the floodlighting lens 82 and F ] the die length of PSD90.

[0042] Although the number of pixels and pitch of a photo detector (location sensing element) in the die-length direction of slit light and a scanning direction can be set as arbitration, in order to except the effect of [ for stationary Mitsunari ], it is desirable to sample beforehand the quantity of light in the condition that the laser beam is not irradiated.

[0043] Moreover, although a color is various, it sets black and a measurement error serves as max especially, since a micron unit is not measured, the accident car body for measurement (automobile car body) can amend a measurement error using the color correction data sampled beforehand. The chromatic aberration of a lens can be amended similarly.

[0044] The thing using the supersonic wave as the approach of 33-dimensional gestalt solid measurement of operation is the gestalt of this operation.

[0045] The optical three-dimension configuration measuring device (50, 52, 54, 60, 62) in the gestalt 2 of operation can also be similarly used as the ultrasonic three-dimension configuration measuring device (a sender and a receiving set are collectively expressed as a box) formed in the both sides of a car body, the upper part, the front, and back (not shown [ back ]).

[0046] Although the following general things are used as a measurement principle, in the location part by which the numeric value to which a deformation degree exceeds the threshold of measurement greatly strongly was measured, approximate-value processing with surrounding measured value is performed.

[0047] A configuration and dimension data, such as configuration measurement data for every type of a car, are beforehand set in a database, and sequential collating processing is carried out with accident vehicle measurement data.

[0048] In an estimated phase, it is only appearance-like measurement of an accident vehicle and the clear problem about resolution is not produced.

[0049] How to ask drawing 9 - drawing 12 for the distance to the measuring object is shown.

[0050] Drawing 9 and drawing 10 show the FM-CW (frequency modulation, continuous wave) approach.

[0051] In drawing 9 , by inputting the output from the modulating-signal oscillator 108 into a voltage controlled oscillator 106, the continuous wave which performed frequency modulation is turned to the measuring object 100 after magnification and from an ultrasonic vibrator (for wave transmission) 102 with power amplification 104, and waves are transmitted. The multiplication of the wave-receiving signal which reflects by the measuring object 100 and is acquired with an ultrasonic vibrator (for wave-receiving) 110 after time delay deltat is carried out after magnification by pre amplifier 112 with the wave transmission signal and multiplier 114 from a voltage controlled oscillator 106, only a low-frequency component is taken out with a low pass filter 116, and the delta frequency which is proportional to distance R in the frequency measuring circuit 118 is obtained.

[0052] Therefore, distance R is [0053] as shown in drawing 10 .

[Equation 2] It asks by  $R=frV/4fm\Delta f$ . Here, for fr, the difference of the frequency of wave transmission and wave-receiving and V are [ the modulation frequency of wave transmission and deltaf of the acoustic velocity in air and fm ] modulation frequency bandwidth.

[0054] Drawing 11 and drawing 12 show the pulse echo approach.

[0055] In drawing 11 , the pulse generated in the wave transmission pulse generating circuit 128 is inputted into an oscillator circuit 126, this output is inputted into an ultrasonic vibrator 122 after magnification with power amplification 124, and a supersonic wave is transmitted to the measuring object 120. A detection output is obtained for wave-receiving which reflected by the measuring object 120 and has returned to the ultrasonic

vibrator 122 by the detector circuit 132 after magnification by pre amplifier 130.

[0056] Therefore, the distance R to the measuring object is [0057] when the time delay from wave transmission to detection is set to deltat, as shown in drawing 12 .

[Equation 3] It asks by  $R=V/2\text{deltat}V=331.5+0.607T$  formula. Here, V is the acoustic velocity in air and T is the temperature of air.

[0058] The three-dimension solid configuration measuring device and approach of being the gestalt of this operation are shown in gestalt 4 drawing 13 of operation - drawing 15 .

[0059] As shown in drawing 13 , the three-dimension solid configuration measuring device of this invention has the pattern light exposure machine 140 which performs the pattern exposure of a high line pattern, such as differing [ which is plurality ] from whenever [ slanting up bearing ] to a vehicle, and the camera 142 which photos the vehicle containing the pattern irradiated from the pattern light exposure machine 140 from whenever [ slanting up bearing ]. A digital still camera, a digital video camera, or a TV camera can be used for a camera 142.

[0060] Drawing 14 shows a part of vehicle which has irradiated the contour-line pattern. If a high line pattern, such as having irradiated from the pattern light exposure machine 144, is irradiated by the vehicle, it will serve as a configuration as shown, for example in drawing 14 . The points on a high line, such as having met in the direction with the configuration of a vehicle, are P1, P2, ..., Pn. The points on a high line, such as having met in another configuration direction of a vehicle, are Q1, Q2, ..., Qn. Such image data is photoed with a camera 146. [0061] Drawing 15 irradiates a contour-line pattern on a non-accident vehicle, and shows the pattern on top of which the image data obtained with the camera 146 and the image data which irradiated the contour-line pattern on the accident vehicle, and was obtained with the camera 146 were laid.

[0062] In drawing 15 , a continuous line is the pattern of a non-accident vehicle, and a broken line is the pattern of an accident vehicle (real vehicle). The points on the contour line of the non-accident vehicle which met in the direction with the configuration of a vehicle are P1, P2, ..., Pn, and the points on the contour line of an accident vehicle are a fruit P1 and a fruit P2. The points on the contour line of the non-accident vehicle which met in another configuration direction of a vehicle are Q1, Q2, ..., Qn, and the points on the contour line of an accident vehicle are a fruit Q1 and a fruit Q2. It is shown that Q2 and a fruit Q2 have lapped.

[0063] With the gestalt of this operation, the image data which sampled the pattern which irradiated the non-accident vehicle for every type of a car beforehand is stored, the comparison operation of this image data and the above-mentioned pattern obtained from the accident vehicle is carried out, and false restoration of the three-dimension configuration of an accident vehicle is carried out.

[0064] Therefore, the following approaches are used.

[0065] (1) Obtain the image data of the pattern which irradiated the non-accident vehicle for every type of a car beforehand.

[0066] (2) Use the image data of the above-mentioned sheep accident vehicle as exposure contour-line data (data which changed a configuration, a vertical interval, dip, etc. into sampling data), and memorize it.

[0067] (3) From the exposure contour-line data of a non-accident vehicle, and the actual geometry data of a real vehicle, reason the configuration of a non-accident vehicle based on matching and the contour-line locations (a vertical interval, distortion, etc.) for every exposure pattern, and restore the relation between exposure pattern deformation and actual geometry.

[0068] (4) A pattern is irradiated on an accident vehicle and image data is obtained.

[0069] (5) Use the image data of the above-mentioned accident vehicle as exposure contour-line data, and memorize it.

[0070] (6) The exposure contour-line data of an accident vehicle are analyzed using inference of (3).

[0071] (7) The configuration of an accident vehicle is restored in false.

[0072] (8) Amend the distortion of the pattern recognition by the lens property of a camera.

[0073] The flow chart of the automobile repair estimated approach based on the three-dimension solid measurement by PD of the accident vehicle which is the gestalt of operation of this invention is shown in drawing 19 from drawing 16 .

[0074] In drawing 16 , PD head location measurement is started (S100), when the plane of composition of whether PD head is carrying out the plane of composition to \*\*\*\* is being judged and (S110) carried out, the head location of PD is memorized (S120), and in accordance with the data of the image database of a vehicle, it displays on a screen (S140, S130). When a plane of composition has not been carried out, it repeats from step

S100. Moreover, when the head location is not changing, S120, S130, and S140 are repeated (S150).

[0075] When the head location is changing, it judges whether the head location is memorized (S160) and the field closed with each head location is constituted (S210). Paint mode is processed when the closed field is constituted (S220).

[0076] When the closed field is not constituted, and when processing in paint mode is completed, a three-dimension configuration is restored (S170). At this time, the data by which three-dimension measurement (S300) was carried out restore a three-dimension configuration in the condition that a screen display (S310) is carried out, based on an automobile image database (S320) (S170).

[0077] Based on S170, a breakage part is judged (S180), and when it is judged that there is a breakage part which surpasses a sheet-metal correction limitation, processing in case there is a breakage part which surpasses (S190) and a sheet-metal correction limitation is performed (S200).

[0078] decision whether when it is judged that the breakage part which surpasses a sheet-metal correction limitation was lost, there is any required breakage part of (S190) and sheet-metal correction -- carrying out (S400) -- being certain -- \*\* -- when it judges, the desorption of a breakage part judges that it is the need (S410). When desorption is required, "desorption" of a breakage part is chosen and an estimate is filled in. Sheet-metal correction is simultaneously entered in an estimate. Selection of required components, and calculation and entry of a characteristic are also performed (S420).

[0079] When it is judged that the desorption of a breakage part is unnecessary (S410), it branches to S430.

[0080] It judges whether furthermore there is any required breakage part of sheet-metal correction (S430), when there is nothing, estimate entry processing (S470) is performed, and it ends. When it is judged that it is furthermore, it judges whether the activity relevant to an old activity arises (S440). When it is judged that there is nothing, return is carried out to step S410, when it is judged that it is, a duplication activity is adjusted (S450), and (characteristic adjustment) duplication components are adjusted (S460). (characteristic adjustment) It returns to step S400 after that.

[0081] When the required breakage part of sheet-metal correction is lost, it branches to (S400) and estimate entry processing (S470).

[0082] Drawing 17 is a flow chart which explains processing (S220) in paint mode to a detail.

[0083] In drawing 17 , since a paint work index changes with locations of the field where the above-mentioned was closed, the location of the whole field is computed (S222). When paint and characteristic calculation 1 are processed when it judges whether the field straddles two breakage range (S224) and it is judged that it straddles (S226), and it is judged that it does not straddle, paint and characteristic calculation 2 are processed (S228). At steps S226 and S228, paint differs from the characteristic to compute.

[0084] Drawing 18 is a flow chart which explains to a detail processing (S200) in case there is a breakage part which surpasses a sheet-metal correction limitation.

[0085] "Exchange" of the breakage part concerned is chosen and drawing 18 is entered in an estimate (S202). Next, a required activity is chosen, a characteristic is computed, an estimate is filled in and required components are chosen (S204). When it is judged that the possibility of secondary breakage judges whether a predetermined threshold is exceeded (S206), and exceeds, in order to choose preparatorily the breakage anticipation part which has the possibility of secondary breakage in an estimate and to check it behind, the attribute of an important point check is given (S208).

[0086] When it is judged that the possibility of secondary breakage does not exceed a predetermined threshold (S206), processing (S200) in case there is a breakage part which surpasses this sheet-metal correction limitation, without performing S208 is ended.

[0087] Drawing 19 is a flow chart which explains estimate entry processing (S470) to a detail.

[0088] In drawing 19 , when paint judges whether it is the need to the breakage part of exchange (S472) and it is judged to it that it is not required, an estimated input screen is changed into a manual entry condition (S478), and it flies to check sheet-metal correction processing of the estimate of S484. When it is judged that it is required, the paint over two more breakage range judges whether it is the need (S474).

[0089] When it is judged that the paint over two breakage range is required, paint and a characteristic are computed, an estimate is filled in (S476), and it returns to S472. When it is judged that it is not required, paint and a characteristic are computed, an estimate is filled in (S480), and an estimated input screen is changed into a manual entry condition (S482).

[0090] Check correction processing of an estimate is performed (S484), and an estimate and a check result are

outputted (S488, S486).

[0091]

[Effect of the Invention] As mentioned above, since the quantitative data about an accident vehicle can be obtained by measuring an accident vehicle for a configuration etc. using the three-dimension solid measurement approach according to the accident vehicle repair cost estimated system by three-dimension solid measurement of this invention as explained, repair cost can be estimated at simple and accuracy.

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[Translation done.]

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2. \*\*\*\* shows the word which can not be translated.
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## CLAIMS

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[Claim(s)]

[Claim 1] The coordinate measuring device which measures the coordinate location data on the three dimension in which the configuration measurement data input device which inputs the configuration measurement data of an accident vehicle, and said configuration measurement data input device exist by irradiating light, A car shape memory means to hold the information about the configuration of a car, and the configuration measurement data transmitted from said configuration measurement data input device, An estimate setting-out means to set up the bid of the repair cost of an accident vehicle based on the coordinate location data transmitted from said coordinate measuring device, and the information on the configuration of the car transmitted from said car shape memory means, In the accident vehicle repair cost estimated system by the three-dimension solid measurement which has an estimate creation means to draw up an estimate based on the estimated data transmitted from said estimate setting-out means The detection section as which said configuration measurement data input unit detects a contact condition with said accident vehicle, An origin assignment means to specify the origin of configuration measurement of said accident vehicle, and a terminal point assignment means to specify the terminal point of configuration measurement of said accident vehicle, To said estimate setting-out means from the light sensing portion which receives the light irradiated from said coordinate measuring device, and said configuration measurement data input unit It has a means to transmit the configuration measurement data obtained by said detection section, said origin assignment means, said terminal point assignment means, or said light sensing portion. Said coordinate measuring device An exposure means to irradiate light from three directions to said configuration measurement data input unit, It has a means to transmit the coordinate location data of said configuration measurement data input device to said estimate setting-out means. Said car shape memory means It has data about the configuration of a non-accident vehicle. Said estimate setting-out means Said configuration measurement data transmitted from said configuration measurement data input device, A count means to ask for the coordinate location of said light sensing portion based on said coordinate location data transmitted from said coordinate measuring device, An amendment means to ask for the coordinate location of said detection section from the coordinate location of said light sensing portion for which it asked with said count means, The data about the configurations of the coordinate location of said detection section obtained with said amendment means and said non-accident vehicle transmitted from said car shape memory means are compounded. A decision means to judge whether there is any breakage part exceeding a sheet-metal correction limitation from the three-dimension configuration of said accident vehicle restored by restoration means to restore the three-dimension configuration of said accident vehicle, and said restoration means, A selection means to choose the estimate of the sheet-metal correction according to a breakage part when it is judged that there is no breakage part where said decision means exceeds a sheet-metal correction limitation, The accident vehicle repair cost estimated system by the three-dimension solid measurement characterized by having a means to transmit the estimate which said selection means chose to an estimate creation means.

[Claim 2] It is an accident vehicle repair-cost estimated system by the three-dimension solid measurement characterized by to have further the position sensor which said configuration measurement-data input device is further equipped with a dispatch means send the coordinate location data of said configuration measurement-data input device, in the accident vehicle repair-cost estimated system by three-dimension solid measurement according to claim 1, and said coordinate measuring device carries out sensing of the coordinate location data which said dispatch means sent from three directions, and measures said coordinate location data.

[Claim 3] The configuration measuring device which measures the configuration of an accident vehicle, and a

car shape memory means to hold the information about the configuration of a car, An estimate setting-out means to choose the bid of the repair cost of an accident vehicle based on the configuration measurement data transmitted from this configuration measuring device, and the information on the configuration of the car transmitted from this car shape memory means, In the accident vehicle repair cost estimated system by the three-dimension solid measurement which has an estimate creation means to draw up an estimate based on the estimated data transmitted from this estimate setting-out means Two or more floodlighting equipments which floodlight said configuration measuring device on said accident vehicle from the left right-hand side of said accident vehicle, an order side, and an upside, Two or more light-receiving equipments which receive the light which it was floodlighted from said floodlighting equipment and reflected with the left right-hand side of said accident vehicle, the order side, and the up side, It has a transfer means to transmit the data about floodlighting of said floodlighting equipment, and the data about light-receiving of said light-receiving equipment to said estimate setting-out means. Said car shape memory means It has data about the configuration of a non-accident vehicle. Said estimate setting-out means A distance count means to find the distance of said accident vehicle and two or more of said floodlighting equipments of each based on the data about floodlighting of said floodlighting equipment which said transfer means transmitted, and the data about light-receiving of said light-receiving equipment, Said distance acquired with said distance count means and the data about the configuration of said non-accident vehicle transmitted from said car shape memory means are compounded. A decision means to judge whether there is any breakage part exceeding a sheet-metal correction limitation from the three-dimension configuration of said accident vehicle restored by restoration means to restore the three-dimension configuration of said accident vehicle, and said restoration means, A selection means to choose the estimate of the sheet-metal correction according to a breakage part when it is judged that there is no breakage part where said decision means exceeds a sheet-metal correction limitation, The accident vehicle repair cost estimated system by the three-dimension solid measurement characterized by having a means to transmit the estimate which said selection means chose to an estimate creation means.

[Claim 4] In the accident vehicle repair cost estimated system by three-dimension solid measurement according to claim 3 said configuration measuring device Two or more wave transmission equipments which transmit a supersonic wave on said accident vehicle from the left right-hand side of said accident vehicle, an order side, and an upside, Two or more wave-receiving equipments which receive the supersonic wave which waves were transmitted from said wave transmission equipment, and was reflected with the left right-hand side of said accident vehicle, the order side, and the up side, It has a transfer means to transmit the data about wave transmission of said wave transmission equipment, and the data about wave-receiving of said wave-receiving equipment to said estimate setting-out means. Said distance count means The accident vehicle repair cost estimated system by the three-dimension solid measurement characterized by finding the distance of said accident vehicle and two or more of said wave transmission equipments of each based on the data about wave transmission of said wave transmission equipment which said transfer means transmitted, and the data about wave-receiving of said wave-receiving equipment.

[Claim 5] In the accident vehicle repair cost estimated system by three-dimension solid measurement according to claim 3 said configuration measuring device The pattern light irradiation device which performs the pattern exposure of a contour-line pattern from whenever [ slanting up bearing / of an accident vehicle ] to this accident vehicle, The photography equipment which photos the configuration data of said accident vehicle including said contour-line pattern irradiated by said accident vehicle from whenever [ slanting up bearing / of said accident vehicle ], It has a transfer means to transmit the configuration data of said accident vehicle which included said contour-line pattern which the data about an exposure and said photography equipment of said pattern light irradiation device photoed in said estimate setting-out means. Said car shape memory means is equipped with the configuration data of this non-accident vehicle including said contour-line pattern irradiated by the non-accident vehicle. Said estimate setting-out means It has further a comparison means to compare the configuration data of said accident vehicle including said contour-line pattern of the accident vehicle transmitted from said configuration measuring device with said configuration data including said contour-line pattern of the non-accident vehicle transmitted from said car shape memory means. Said restoration means The accident vehicle repair cost estimated system by the three-dimension solid measurement characterized by restoring the configuration of said accident vehicle based on the comparison of said comparison means.

[Claim 6] In the estimate setting-out means in the accident vehicle repair cost estimated system by three-dimension solid measurement This configuration measurement data transmitted from the configuration measurement data input device which inputs the configuration measurement data of an accident vehicle, A

count means to ask for the coordinate location of the light sensing portion which receives the light irradiated from this coordinate measuring device based on these coordinate location data transmitted from the coordinate measuring device which measures the coordinate location data on the three dimension in which this configuration measurement data input device exists, An amendment means to ask for the coordinate location of the detection section which detects a contact condition with said accident vehicle from the coordinate location of said light sensing portion for which it asked with said count means, The data about the configuration of the non-accident vehicle transmitted from a car shape memory means to hold the information about the coordinate location of said detection section obtained with said amendment means and the configuration of a car are compounded. A decision means to judge whether there is any breakage part exceeding a sheet-metal correction limitation from the three-dimension configuration of said accident vehicle restored by restoration means to restore the three-dimension configuration of said accident vehicle, and said restoration means, The estimate setting-out means characterized by having a selection means to choose the estimate of the sheet-metal correction according to a breakage part, and a means to transmit the estimate which said selection means chose to an estimate creation means when it is judged that there is no breakage part where said decision means exceeds a sheet-metal correction limitation.

[Claim 7] In the estimate setting-out means in the accident vehicle repair cost estimated system by three-dimension solid measurement said estimate setting-out means The data about floodlighting of two or more floodlighting equipments floodlighted on this accident vehicle from the left right-hand side of an accident vehicle, an order side, and an upside, A distance count means to find the distance between this accident vehicle and these two or more floodlighting equipments of each based on the data about light-receiving of two or more light-receiving equipments which receive the light from the left right-hand side which this floodlighting equipment floodlighted and was reflected from said accident vehicle, an order side, and an upside, The data about the configuration of the non-accident vehicle transmitted from a car shape memory means to hold the information about said distance acquired with said distance count means and the configuration of a car are compounded. A decision means to judge whether there is any breakage part exceeding a sheet-metal correction limitation from the three-dimension configuration of said accident vehicle restored by restoration means to restore the three-dimension configuration of said accident vehicle, and said restoration means, A selection means to choose the estimate of the sheet-metal correction according to a breakage part when it is judged that there is no breakage part where said decision means exceeds a sheet-metal correction limitation, The accident vehicle repair cost estimated system by the three-dimension solid measurement characterized by having a means to transmit the estimate which said selection means chose to an estimate creation means.

[Claim 8] In the estimate setting-out means in the accident vehicle repair cost estimated system by three-dimension solid measurement according to claim 7 said distance count means The data about wave transmission of two or more wave transmission equipments which transmit a supersonic wave on said accident vehicle from the left right-hand side of said accident vehicle, an order side, and an upside, It is based on the data about wave-receiving of two or more wave-receiving equipments which receive a supersonic wave from the left right-hand side which said wave transmission equipment transmitted and was reflected from said accident vehicle, an order side, and an upside. The estimate setting-out means in the accident vehicle repair cost estimated system by the three-dimension solid measurement characterized by finding the distance between said accident vehicle and said two or more wave transmission equipments of each.

[Claim 9] In the estimate setting-out means in the accident vehicle repair cost estimated system by three-dimension solid measurement according to claim 7 said estimate setting-out means The configuration data of this accident vehicle including the contour-line pattern of the accident vehicle transmitted from the configuration measuring device which measures the configuration of an accident vehicle, It has further a comparison means to compare the configuration data transmitted from a car shape memory means to hold the configuration data of this non-accident vehicle including this contour-line pattern irradiated by the non-accident vehicle. Said restoration means is an estimate setting-out means in the accident vehicle repair cost estimated system by the three-dimension solid measurement characterized by restoring the configuration of said accident vehicle based on the comparison of said comparison means.

[Claim 10] The configuration measurement data input step which inputs the configuration measurement data of an accident vehicle with a configuration measurement data input device, The coordinate measurement step which measures the coordinate location data on the three dimension in which said configuration measurement data input device exists with a coordinate measuring device, The configuration measurement data obtained by said configuration measurement data input step, The estimate setting-out step which sets up the bid of the

repair cost of an accident vehicle based on the coordinate location data obtained by said coordinate measurement step, and the information on the configuration of the car obtained from a car shape memory means by which the configuration of a non-accident vehicle was memorized, In the accident vehicle repair cost estimated approach by the three-dimension solid measurement which has the estimate creation step which draws up an estimate based on the estimated data obtained by said estimate setting-out step The light-receiving step which receives the light by which said configuration measurement data input step was irradiated from said coordinate measuring device by the light sensing portion, The detection step which detects a contact condition with said accident vehicle in the detection section, and the origin assignment step which specifies the origin of configuration measurement of said accident vehicle, To said estimate setting-out step from the terminal point assignment step which specifies the terminal point of configuration measurement of said accident vehicle, and this configuration measurement data input step It has the step which transmits the configuration measurement data obtained by said light-receiving step, said detection step, said origin assignment step, or said terminal point assignment step. The exposure step to which said coordinate measurement step irradiates light from three directions to said configuration measurement data input unit, It has the step which transmits the coordinate location data of said configuration measurement data input device to said estimate setting-out step. Said estimate setting-out step Said configuration measurement data obtained by said configuration measurement data input step, The count step which asks for the coordinate location of said light sensing portion based on said coordinate location data obtained by said coordinate measurement step, The amendment step which asks for the coordinate location of said detection section from the coordinate location of said light sensing portion for which it asked by said count step, The data about the configurations of the coordinate location of said detection section obtained by said amendment step and said non-accident vehicle obtained from said car shape memory means are compounded. The decision step which judges whether there is any breakage part exceeding a sheet-metal correction limitation from the three-dimension configuration of said accident vehicle restored by the restoration step which restores the three-dimension configuration of said accident vehicle, and said restoration step, The selection step which chooses the estimate of the sheet-metal correction according to a breakage part when it is judged that there is no breakage part where said decision step exceeds a sheet-metal correction limitation, The accident vehicle repair cost estimated approach by the three-dimension solid measurement characterized by having the step which transmits the estimate which said selection step chose to an estimate creation step.

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[Translation done.]

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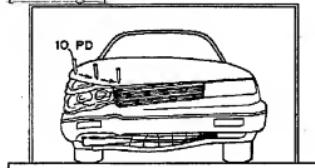
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DRAWINGS

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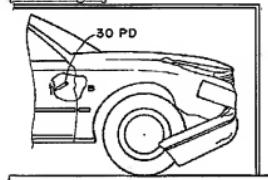
[Drawing 1]



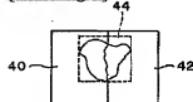
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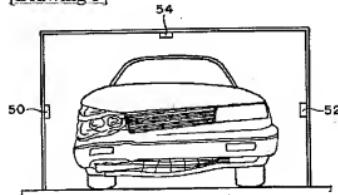
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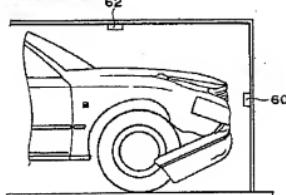
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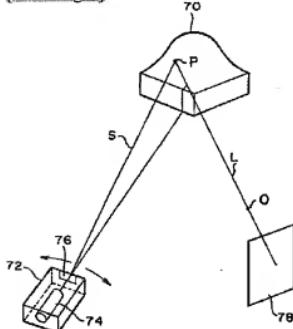
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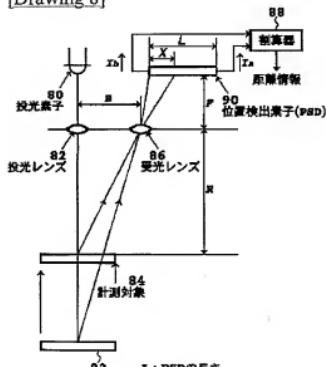
[Drawing 6]



[Drawing 7]



[Drawing 8]



L : PSDの長さ

$x_a$  : 受光位置

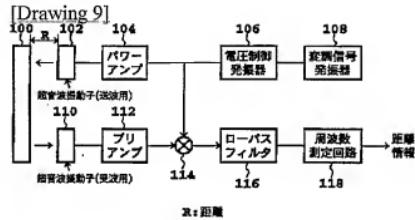
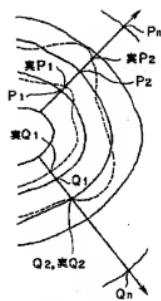
R : 対象対象とレンズの距離

F : レンズとPSDの距離

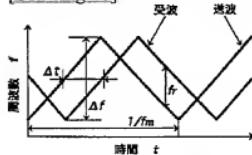
B : 受光レンズと投光レンズの距離

$I_a$ ,  $I_b$  : 電 流

[Drawing 14]



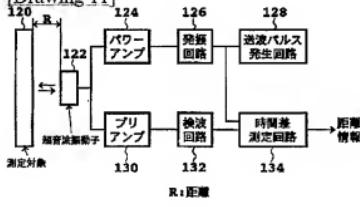
[Drawing 10]



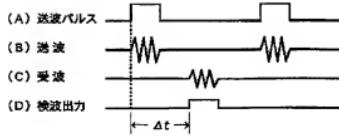
$f_r$ : 送波と受波の周波数の差

$f_m$ : 送波の周波数

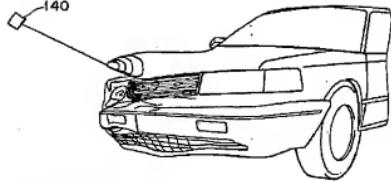
[Drawing 11]



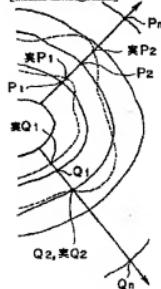
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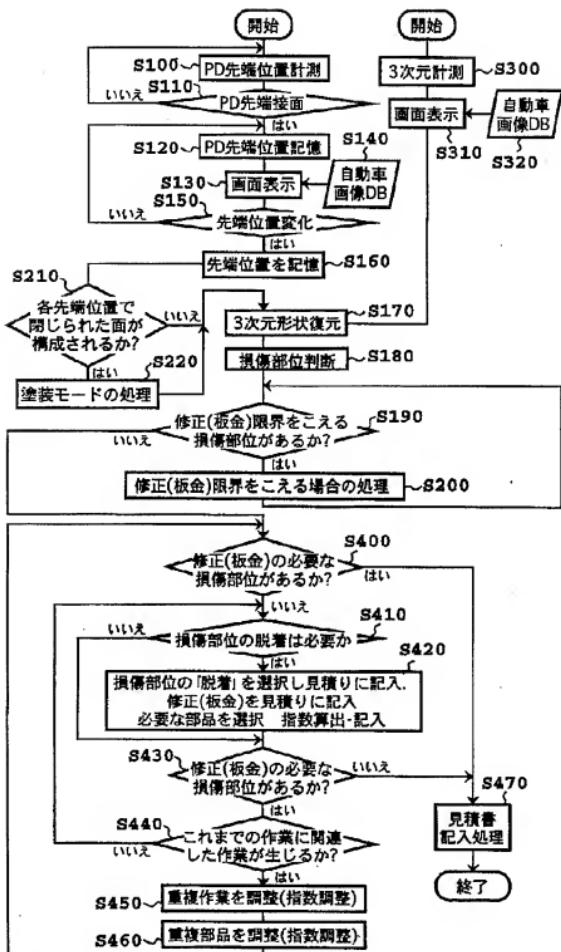
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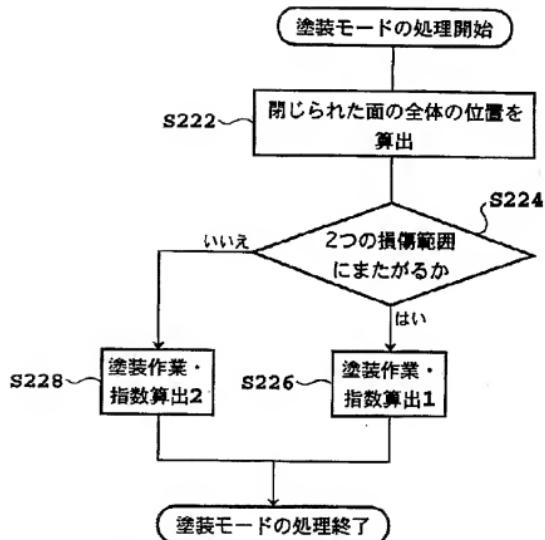
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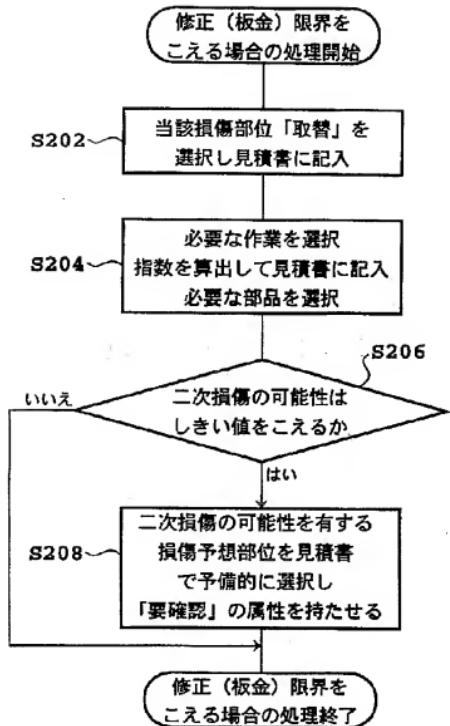
[Drawing 16]



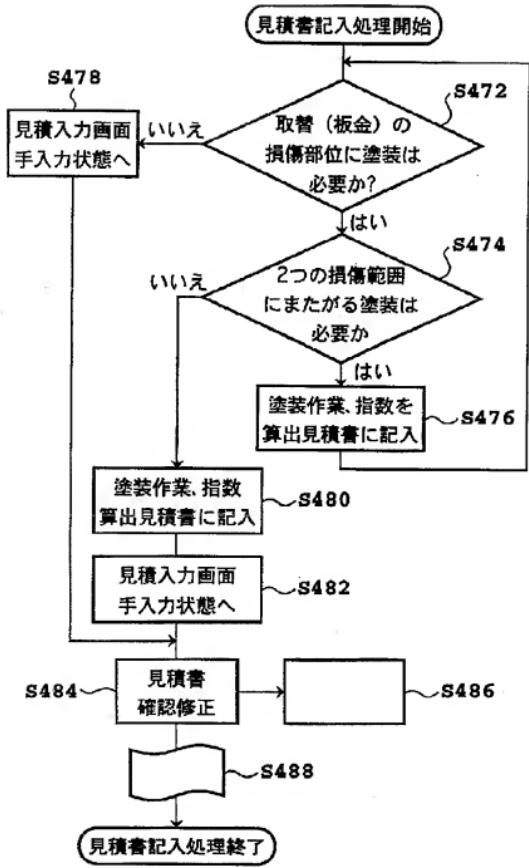
[Drawing 17]



[Drawing 18]



[Drawing 19]



[Translation done.]